

NOXIOUS TIMES

a quarterly publication of the California Interagency Noxious Weed Coordinating Committee

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Cal-IPC Symposium 2004

The California Invasive Plant Council (Cal-IPC) symposium 2004 entitled "Invasive Plants and the Wildland/Urban Interface" will occur October 7th thru Saturday October 9th at the Holiday Inn Ventura Beach Resort in Ventura, California. Wildland weed workers from around the state are invited to meet and learn the latest about invasive plant biology and management. The Symposium will address the given theme for the event, current topics, and more.

Program Outline: October 7-9, 2004 Ventura, CA

Thursday, October 7

7:00am Registration begins

Session 1: Laws and Regulations

Session 2: Migration of Ornamental Plants Across the Wildland/Urban Interface

Session 3: Working Groups I (concurrent, topics to be announced)

Session 4: Contributed papers: Volunteer Weed Control Efforts (concurrent with Session 5)

Session 5: Contributed Papers: Academic Research (concurrent)

Friday, October 8

Session 6: Habitat Fragmentation and Edge Effect

Session 7: Working Groups II (concurrent, topics to be announced)

Session 8: Funding Urban Invasive Projects (Concurrent)

Session 9: Contributed Papers: Field Techniques

Session 10: Invasive plants and Fire at the Wildland/Urban Interface

Saturday, October 9, Field Trips:

Channel Islands National Park, Santa Monica Mountains and the Point Mugu Saltmarsh, and the Santa Clara River and an Arundo Plantation removal.

Come Present at the Cal-IPC Symposium

2004 Call for Papers!

Deadline August 13, 2004

The California Invasive Plant Council (Cal-IPC) invites members of the wildland weed community to submit abstracts for oral or poster presentations for the thirteenth annual Symposium. Oral presentations are 12 minutes with 3 minutes for questions; posters will be mounted in the Exhibit hall. Presentations on volunteer weed control efforts, funding of urban projects, and cutting edge research are particularly encouraged. Students are especially encouraged to present their research findings.

Abstracts should be 150-250 words including: title, author, affiliation, and contact info. Speakers save \$45 off regular registration, which includes 5 meals at the conference center. Abstracts for talks should be sent to Daniel Gluesenkamp at gluesenkamp@egret.org

Abstracts for posters should be sent to Deanne DiPietro at Deanne.
dipietro@sonoma.edu

A detailed program will be available in July at www.cal-ipc.org.

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U.S. Department of Interior, National Park Service

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Chairperson's Message

Bobbi Simpson, National Park Service

Here we are, a few months into 2004 and our first meeting is planned for April 20th. I am excited about the opportunity to serve the California Invasive Noxious Weed Coordinating Committee. I'd like to concentrate on the development of ways we can work cooperatively. As I begin the process of identifying ways we can work together, natural categories arise: partnerships, funding, interdisciplinary solutions, new control techniques being used, planning and prevention efforts, etc.

For our first meeting, it would be nice to get a solid understanding of who wants to participate in partnerships and how various groups funding mechanisms work. For instance with the National Park Service, we have annual funding calls that are applicable for weed management work. With some grant sponsors we must find an external non-federal partner to establish common goals, some funding must be obligated by the end of our fiscal year – others not so. On all of our projects, it is important we keep abreast of what is going on in the surrounding watershed. As we organize our role in the larger scheme of weed management across the state, I hope we will find easy links that will help us all to leverage what we individually bring to the table.

I hope that both agencies and non-governmental groups will be willing to participate by helping forge the agenda for this group. Some of the areas I would like to see discussed include: identification of key players including both agencies (state, federal, county, city) and Non-governmental organizations; how to extend what we can do by dovetailing our efforts; how best to share knowledge; prevention programs; how we relate to National Committees and National Initiatives; identification of agencies resources (money, equipment, workforce, expertise, etc.); featuring and rewarding successful programs; time management in the sometimes overwhelming arena of weed management; vector management; inventory, monitoring, and mapping. (Can we merge our various maps?)

With CDFA's continued support and your participation I look forward to seeing us develop concrete ways to help each other.

Noxious Times is a publication of the California Interagency Noxious Weed Coordinating Committee. The committee was formed in 1995 when 14 federal, state, and county agencies came together under a Memorandum of Understanding to coordinate the management of noxious weeds. The committee's mission is to facilitate, promote, and coordinate the establishment of an Integrated Pest Management partnership between public and private land managers toward the eradication and control of noxious weeds on federal and state lands and on private lands adjacent to public lands.

The Noxious Times newsletter intends to help the committee achieve its goals of coordination and exchange of information by providing land managers throughout the state with information on weed control efforts, news, and successes.

Noxious Times is published quarterly by staff of the Integrated Pest Control Branch at the California Department of Food and Agriculture. We welcome submissions for our upcoming issues. Please send to: CA Department of Food and Agriculture, ATTN: Noxious Times, 1220 N Street, Room A-357, Sacramento, CA 95814 or e-mail: noxtimes@cdfa.ca.gov

If you have a colleague whose name you would like to add to our mailing list, please send mailing information to the address above.

Noxious Times Editorial Staff: Steve Schoenig, Katherine Blackman. Text written by staff unless otherwise noted.

Invasive Weeds Day at the Capital

The California Invasive Weed Awareness Coalition (CALIWAC) sponsored the first annual Invasive Weeds Day at the Capital in Sacramento on Wednesday, March 24, 2004. The day was an opportunity to educate legislators and agencies about invasive weed issues and the effects of these plants on Californians. CALIWAC spearheaded the event, inviting anyone involved in invasive weed projects in California to attend and help prepare legislators and agencies for when additional federal and/or state funding becomes available. Currently there are insufficient resources to fund local weed groups and projects adequately.

The morning consisted of informative briefings by representatives of the California Department of Food and Agriculture (CDFA), the California Department of Transportation, California Department of Fish and Game and Sacramento Area Flood Control Agency. Legislative updates were presented by Assembly Member Tim Leslie and his Legislative Director, Kevin O'Neill and Melva Bigelow, Legislative Director with The Nature Conservancy. These presentations stimulated great questions and dialogue. The afternoon consisted of meetings with legislators where attendees met with 45 legislators and/or staff members to discuss important statewide issues. In addition, a CALIWAC team met with Deputy Secretaries at the Governor's office, CDFA and the Resources Agency to discuss statewide invasive and noxious weed issues.

CALIWAC is a coalition of private sector groups, concerned about invasive weeds in California. Their mission is to promote public awareness and enhance existing weed control efforts in the state. CALIWAC has asked the legislature to support three specific things: first, to support Weed Management Areas (WMA) in their continued implementation of weed removal projects, public education projects, and mapping efforts; second, to support the California State Weed Plan, a statewide plan for dealing with invasive plants; and finally, the legislators were asked to continue to help build public awareness by supporting California Invasive Weeds Awareness Week enacted by the legislature in 2003 via ACR 114 (Leslie).

(Right) Scott Oneto with the Amador County Weed Management Area(background) and Jose Vargas with the Alameda County Agriculture Department (foreground) attended meetings at the first annual Invasive Weeds Day at the Capital.



(Ubove) Some members of the CALIWAC team, Nelroy Jackson (National Invasive Species Advisory Council, Bob Pickard (Mariposa County, Chair of CALIWAC), Andrea Fox (Ca. Farm Bureau Federation), Doug Johnson (Ca. Invasive Plant Council)



A National Early Detection and Rapid Response System on the

A plan to unite weed management efforts on a national level has been in the works now for over 5 years. The Federal Interagency Committee for the Management of Noxious and Exotic Weeds (FICMNEW) formally identified the need for a national system for early detection and rapid response to invasive plant species. There has been a growing awareness in recent years that introduced invasive species are having significant and increasing impacts on the U.S. economy, ecosystems, native species, and human health. The U.S. is particularly vulnerable to biological invasions because of tremendous biome-level diversity and a large inventory of relatively intact ecosystems. After 5 years of planning, FICMNEW released a document that contains the first phase of the national system.

The document, titled the Conceptual Design for National Early Detection and Rapid Response (EDRR) System for Invasive Plants in the United States, was released to various agencies and land managers in September of 2003. To evaluate the conceptual design, and to adapt the design to address any overlooked facets, FICMNEW will coordinate internally among the member agencies and with external partners to further develop and test the system. Ultimately implementation of the system depends on lessons learned during testing, which will occur during the second phase of the system.

How was the design prepared?

A national workshop on the creation of the system was conducted in June 2000 in cooperation with the U.S. Department of Agriculture (USDA) and the U.S. Department of the Interior's U.S. Geological Survey. Participants in the workshop included representatives from federal and state agencies, industry, environmental organizations, and private landowners, as well as international experts. Member agencies, the general public, NGOs, and invasive plant management stakeholders were involved throughout evolution of the design. The FICMNEW submitted at least six formal requests for review to over 100 agencies and organizations. A final call for written comments was made in July 2002.

Elements of the National EDRR System for Invasive Plants

The overall goal of the National EDRR System for Invasive Plants is to minimize the establishment and spread of new species. The main elements for the system are: early detection and reporting of suspected new plant species to appropriate officials; identification and vouchering of submitted specimens by designated specialists; verification of suspected new state and national plant records; rapid assessment of confirmed new records; rapid response to verified new infestations that are determined to be invasive. To achieve the overall goal of minimiz-

ing the spread of new species, FICMNEW has broken down the aforementioned five elements and identified the secondary goals, objectives, and necessary actions for a successful plan. The components can be found in detail in the document.

If the overall goal is to be achieved then it is clear that the public will need to become more involved. Much of the plan includes collaboration and cooperation among state, federal and international agencies, but also includes developing a network of volunteer, amateur, and professional plant enthusiasts and encouraging detection and reporting by concerned landowners, ranchers, farmers, certified crop consultants, master gardeners, public land volunteer groups, The Nature Conservancy, Exotic Pest Plant Councils (EPPC), and others.

Some of the key concepts in the design are:

- ✓ Develop a network of amateur and professional plant enthusiasts.
- ✓ Develop a training and certification program for volunteers.
- ✓ Develop a computer-assisted system for identification.
- ✓ Establish a toll-free number and website for the general public to use.
- ✓ Request that personnel at local offices act as local contacts
- ✓ Use the North American Weed Management Association standards for collecting data.
- ✓ Develop computer based identification keys.
- ✓ State partner groups to establish online databases.
- ✓ Develop protocols and procedures for submitting confirmed new plant records.
- ✓ Establish protocols and procedures for reporting new State and National plant records.
- ✓ Conduct workshops to develop an ecological assessment process.
- ✓ Ensure that a State Rapid Assessment Committee will conduct ecological assessments.
- ✓ Develop broadly applicable rapid response protocols.
- ✓ Develop a cadre of scientists and technical specialists to provide on-site and support.
- ✓ Identify biologically sound management options.
- ✓ Explore ways to tie EDRR issues to major trade

The Second Phase of the System: Testing the Elements

A major goal of the second phase is to test the elements and processes in the system in several states. The

California Farm Bureau and the American Farm Bureau Recently Adopted a New Policy for Invasive Species

The impact of noxious, invasive species on agricultural lands is a serious problem, costing farmers and ranchers millions of dollars each year in control and eradication measures and in the loss of productive land and nutritious forage for livestock and wildlife.

Last year California Farm Bureau president, Bill Pauli testified before a joint oversight hearing of House Resources subcommittees on the growing problem of invasive species. He stated that "Farmers and ranchers are being economically impacted by the importation of exotic pests and diseases and that invading, non-indigenous species in the United States cause major economic losses in agriculture, forestry and other segments of the U. S. economy." He urged immediate and appropriate action to combat this threat and restated that the Farm Bureau strongly supports an aggressive program at the local, state and federal levels to prevent the introduction of invasive species to the United States.

California Farm Bureau and the American Farm Bureau recently adopted a new policy for "Invasive Species" that urges state and national agencies to create policies and controls for the management and eradication of invasive species.

The policy is predicated on the following principles:

- ✓ Respect for private property rights.
- ✓ The establishment of a clear definition of noxious, invasive, harmful species.
- ✓ Emergency measures that allow for the timely use of chemical controls.
- ✓ Management practices for endangered or threatened species that also recognize and address the role of noxious, invasive and harmful species.
- ✓ Compensation for crop and livestock losses from invasive species when quarantine requirements or treatment methods are the basis for the loss.
- ✓ The provision of funding for inspection services and facilities, public education and outreach.
- ✓ The coordination and cooperation between public land managers and private landowners for the control and elimination of invasive species.
- ✓ Incentive programs for farmers and ranchers that encourage the effective control of noxious and aquatic weeds along with support for an Integrated Pest Management (IPM) approach.

For information about the Farm Bureau policy, contact Andrea Fox at 916-446-4647 or email at afox@cbbf.com.

Washington Reviews the Harmful Invasive Weed Control Act of 2003

The Subcommittee on National Parks, Recreation and Public lands, a sub-committee to the House of Representatives Committee on Resources, will conduct a legislative hearing April 29, 2004 on Senate Bill 144 (S.144). This bill was passed by the Senate on March 4, 2003 and must now pass through the Committee on Resources, followed by the Agricultural Committee if it is going to make it to the house floor. S.144 would require the Secretary of the Interior to establish a program to provide assistance through States to eligible weed management entities to control or eradicate harmful, nonnative weeds on public and private land.

Appearing before this subcommittee to The House of Representatives Committee on Resources is: Fred Grau, President of Grasslyn, Inc.; Brenda Waters, Noxious Weed Coordinator, Idaho State Department of Agriculture; Debbie Hughes, New Mexico State Association of Soil and Water Conservation Districts, and Steve Schoenig, Senior

Environmental Research Scientist, California Department of Food and Agriculture (CDFA).

Senator Larry Craig of Idaho introduced S.144 on January 13, 2003. This bill pairs with H.R.119, which was introduced by Representative Joel Hefley of Colorado on January 7, 2003, to form The Harmful Invasive Weed Control Act of 2003. Passage and implementation of the bills will support weed management entities throughout the country in their efforts to effectively manage invasive species.

This assistance would provide a foundation for weed management entities to operate. Often these entities contribute matching funds through both in-kind and outside contributions and resources, increasing the effectiveness of management programs.

Herbicide Resistance in Weeds: How Serious a Problem is it in Wildlands?

Joseph M. DiTomaso, University of California, Davis

Resistance to both insecticides and fungicides has been known for many years. Insecticide resistance in arthropods was first reported in 1908 and today there are more than 500 species of insects and mites that are resistant to various insecticides. By comparison, pathogen resistance to fungicides was first reported in 1940, and has been increasing, with greater than 150 species now known to resist various fungicides.

Weed resistance to herbicides is a recent phenomenon. The first report of herbicide resistance occurred with the discovery of triazine-resistant common groundsel (*Senecio vulgaris*) in the late 1960's. Since that time, over 280 weed biotypes (Figure 1) of 170 species in 59 countries have evolved resistance to herbicides, and resistant weeds infest over 7 million

acres of cropland. The United States has the most herbicide resistant biotypes at 107. Much of this information is included on a web site developed by Dr. Ian Heap (<http://www.weedscience.org/in.asp>).

"The conditions that lead to the rapid selection of herbicide resistance in weeds are not often met in wildland or rangeland areas."

[org/in.asp](http://www.weedscience.org/in.asp).

Of the species shown to be resistant to herbicides worldwide, the majority of cases occur in genera and species that occur as weeds of agricultural environments. This is primarily due to factors associated with characteristics of specific weeds, herbicides, and weed management practices. For example, high seed production coupled with genetic variation increases the probability of resistance evolution. Of the major weeds developing resis-

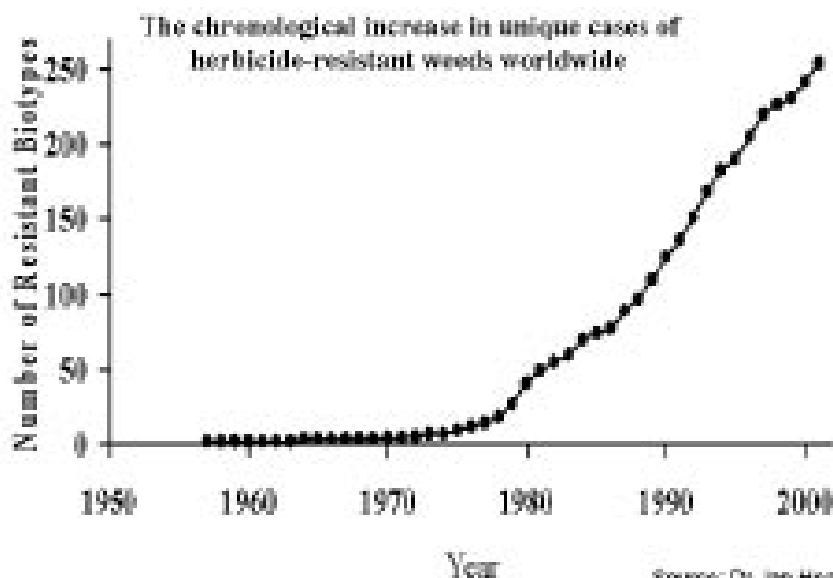
tance to herbicides, all are annuals. Perennial weeds, particularly those with vegetative reproductive tissues, are less likely to evolve resistance compared to weeds with an annual life cycle that produces abundant seeds.

Weed characteristics conducive to rapid development of resistance to a particular herbicide include: (1) annual growth habit, (2) high seed production, (3) relatively rapid turnover of the seed bank due to high percentage of seed germination each year (i.e., little seed dormancy), (4) several reproductive generations per growing season, (5) extreme susceptibility to a particular herbicide, (6) high frequency of resistant gene(s), (e.g., *Lolium rigidum*, *Chenopodium album*, *Avena fatua*).

In contrast, weed species less likely to develop resistance generally have 1) a slower generation time, 2) incomplete selection pressure for most herbicides, 3) lower fitness for resistant biotypes, and 4) extended seed dormancy in the soil. These factors increase the number of susceptible biotypes in the population. Some herbicide characteristics can also lead to rapid development of resistance in weed biotypes. For example, herbicides with a single site of action, common metabolic pathway for detoxification in plants (i.e., cytochrome P-450 monooxygenase, glutathione-S-transferase), long residual activity in the soil, or high effective kill on a wide range of weed species are more likely to select for resistant weeds biotypes.

Cultural practices can often be the most important factor that leads to the selection of herbicide resistant biotypes. In general, complete and repeated reliance on a single herbicide,

Figure 1.



or herbicides with the same mode of action, for weed control can greatly enhance the occurrence of herbicide resistant weeds. This is particularly true when no other weed control option is used (e.g., mechanical or cultural control practice).

The conditions that lead to the rapid selection of herbicide resistance in weeds are not often met in wild-

land or rangeland areas. This is probably due to several factors. In most wildland areas herbicides are not used as intensively as in croplands, with repeated applications within a single year or over several consecutive years. Although the number of herbicides available are few, most belong to the growth regulator chemical families (e.g., 2,4-D, dicamba, triclopyr, clopyralid). Resistance to these herbicides is not as common as might be expected considering that the length of time they have been available and their extensive use. It is thought that most mutations at site of action of these herbicides would be self-lethal, as they would also reduce the activity of the naturally occurring growth regulator that they mimic (indole acetic acid, IAA). Nevertheless, in the state of Washington, a population of yellow starthistle (*Centaurea solstitialis*) was shown to be resistant to picloram, and cross-resistant to clopyralid and other auxin herbicides. This population has not spread, but does demonstrate that the possibility of developing herbicide resistance in wildland weed species still exists.

In California, herbicide resistance currently is most widespread in aquatic weeds of rice production. There are currently biotypes of 15 different weed species that have developed resistance to herbicides in California. Based on the information from Dr. Heap's website, these biotypes are found in 1,780 sites, infesting more than 199,000 acres. They

occur in almonds, asparagus, barley, onion, railways, rice, roadsides, and wheat. The most widespread resistant weed of California is purple ammannia (*Ammannia robusta*), which infests an estimated 10,000-100,000 acres and is found primarily in rice.

Only three of these species have

may be transferred among closely related species. For example, in a greenhouse study one acetolactate synthase (ALS)-resistant *Amaranthus* species was capable of transferring resistance to another susceptible *Amaranthus* species. Since *Lolium* species have been known hybridize,

it is possible that the glyphosate resistance gene can be transferred

through

wind pollination from rigid ryegrass to other *Lolium* species, particularly perennial and Italian ryegrass. These species are far more widespread in California than rigid ryegrass and in some locations are primarily controlled with glyphosate. Unlike rigid ryegrass, other ryegrass species can pose a threat to wildlands habitats. Thus, the potential does exist for the development of glyphosate resistance in invasive species that can be significant wildland weed problems.

A reduction in the occurrence of resistance and management of established resistant biotypes in both agricultural and non-agricultural systems could be more effectively accomplished with a greater reliance on integrated weed management approaches. These strategies can incorporate other control tools, such as crop rotation, planting of competitive native species, rotating herbicides with different modes of action, and combining mechanical, biological and cultural control options into a rationale herbicide program. In addition, preventative strategies and frequent monitoring can also reduce the risk of spreading herbicide resistant weeds. These include prevention of weed spread by using clean equipment, monitoring the initial evolution of resistance by recognizing patterns of weed escapes typical to resistant plants, and controlling weeds suspected of being herbicide

"A reduction in the occurrence of resistance...could be more effectively accomplished with a greater reliance on integrated weed management approaches."

developed resistance in non-crop areas. In 1989, perennial ryegrass (*Lolium perenne*) was shown to develop resistance to the sulfonyl-urea herbicides (sulfometuron-methyl) along roadsides and railways in California. A roadside survey conducted in 1995 and 1996 found that resistance to sulfonylurea herbicides was common in Russian thistle (*Salsola tragus*). In 1998, a rigid ryegrass (*Lolium rigidum*) biotype exhibited resistance to glyphosate in a northern California orchard and along roadsides. This glyphosate resistant biotype of rigid ryegrass has spread rapidly over the past couple of years and is now estimated to be found on between 1,000 and 10,000 acres in Colusa and Yolo counties, and most recently in Madera County.

The development of glyphosate resistance has caused some concern in many areas of the country and world, particularly with the widespread use of glyphosate resistant crops. However, despite the extensive use of glyphosate since its introduction in 1974, only five species worldwide have developed resistance (Table 3) in six countries, with the first case being discovered 22 years after its introduction. Of the five species developing resistance to glyphosate worldwide, only one, rigid ryegrass, has been reported in California. The development of resistance in rigid ryegrass is likely due to the continuous use of glyphosate for several years in an orchard near Chico.

It is possible that resistance

TARGET: PURPLE LOOSESTRIFE

By David Kratville¹, Carri Pirosko¹, David Butler², and Susan Monheit¹

Purple loosestrife (*Lythrum salicaria*) is an aggressive noxious weed that is invading the wetlands of California. This non-native plant was first introduced into North America through contaminated ship ballast water in the 1800s, as a medicinal herbal and ornamental plant, and by beekeepers (Bossard et al. 2000). Purple loosestrife's initial westward movement occurred along the extensive network of canals in the North East. Purple loosestrife's expansion into the arid West was facilitated by the building of highways which cut across watersheds, combined with an increase in irrigated land (Thompson et al 1987). In California, purple loosestrife currently exists in small but growing incipient infestations.

This article will cover the biology of purple loosestrife, its weedy characteristics, and the *California Department of Food and Agriculture (CDFA) Purple Loosestrife Control Project's* efforts to combat this noxious weed.

Purple loosestrife is a perennial weed that can produce from one to fifty upright stems per plant. The four-sided semi-woody stems average two to seven feet tall at maturity. The lanceolate leaves are arranged in alternating opposite pairs. Long, showy spikes with numerous pink to reddish-purple flowers appear from June to September. The root crowns of mature plants can ultimately form dense mats that exclude other plant life.

Purple loosestrife spreads primarily by copious production of ground pepper-sized seeds, which, along with small floating seedlings, are easily distributed by flowing water. If these propagules establish in moist, disturbed soil, purple loosestrife may form dense monospecific stands that crowd out native wetland vegetation and impact associated wildlife. Purple loosestrife's impact and ability to spread quickly poses an escalating threat to wetland and riparian habitats in California.

Purple loosestrife is included on the Global Invasive Species Program's list of "100 of the World's Worst Invasive Alien Species." Purple loosestrife is listed by the CDFA as a "B" rated noxious weed and as a "species with



potential to spread explosively" by the California Invasive Plant Council. Because of its ability to form monospecific stands over large areas, purple loosestrife makes up more than 50 percent of the biomass of emergent wetland in many states. These monospecific stands cause canopy closures that exclude most understory species, resulting in reduced biodiversity. Research has shown that common emergent aquatics such as cattails (*Typha* spp.), sedges (*Carex* spp.), and smartweed (*Polygonum* spp.), submersed plants such as pondweed (*Potamogeton* spp.), and floating plants such as duckweed (*Lemna minor*) cannot successfully compete with purple loosestrife (Thompson et al. 1987; Weihe and Neely 1997; Fernberg 1998). Complex food webs that are maintained by a diversity of native wetland plants and aquatic habitats are excluded or

become simplified. Animals that rely on the native vegetation for food, shelter, breeding and nesting areas cannot use these heavily infested areas (Skinner et al. 1994; Thompson et al. 1987). Purple loosestrife has impacted numerous threatened or endangered native wetland plants and wildlife in other states. Diverse wildlife and wetland vegetation, including California special status and listed plants and/or wetland-dependent species could similarly be threatened.

The complex interface between farmland and water provides a rich and varied habitat for wildlife, especially birds. In the California Delta, the principle attraction for waterfowl is winter-flooded agricultural fields. During fall and winter, these fields provide a food source and a resting area for migratory birds. Waterways, irrigation canals, and channels feeding these systems are at risk of infestation by purple loosestrife. Small mammals also find suitable habitat in the Delta's vegetated levees, remnants of riparian forest, and undeveloped islands. The area supports a wide variety of wildlife, including songbirds, hawks, owls, reptiles, and amphibians. It has been documented that purple loosestrife threatens such wildlife-related recreational opportunities as bird watching, fishing, and hunting (Skinner et al. 1994; Piper 1996).

The fact that purple loosestrife impedes the rate of natural water flow, causing increased silt deposition and re-

¹ California Department of Food and Agriculture Integrated Pest Control Branch

² Sacramento-Yolo Mosquito and Vector Control District

duction in water quality, has generated substantial concern in western states (Malecki et al. 1993). Purple loosestrife infestations could also decrease storage capacities of both current and future impounded water bodies.

In 2000, the *CDFA Purple Loosestrife Control Project* began. Initial funding came from the CALFED Bay-Delta Program's Ecosystem Restoration Program, which granted the CDFA a three-year grant to survey and control purple loosestrife in the Sacramento-San Joaquin River Delta and associated watersheds. Additional funding has come from the National Fish and Wildlife Foundation's Pulling Together Initiative, which has granted the CDFA successive one-year grants for the survey and control of purple loosestrife in non-Delta watersheds. In 2003, the California Bay-Delta Authority³ granted the CDFA a one-year emergency extension to continue its survey and control program in the Delta.

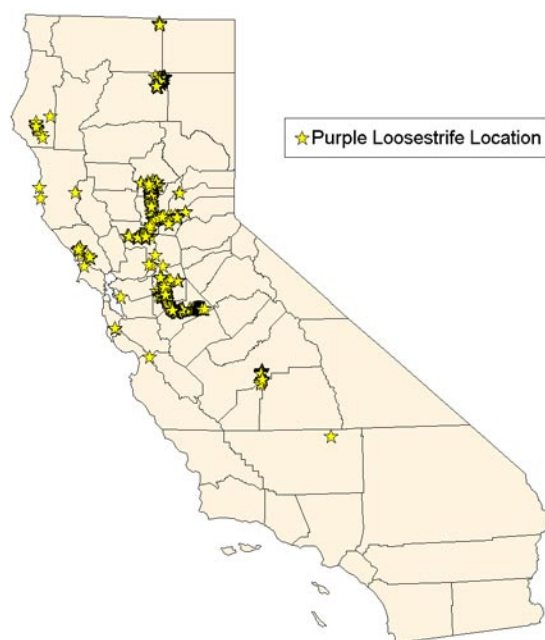
The *CDFA Purple Loosestrife Control Project* has been a highly collaborative effort, involving many state, federal, Native American, and private partners. The county Agricultural Commissioners share or take the lead role with the CDFA on all county weed projects. Local Weed Management Areas, which are made up of concerned citizens, members of private groups, and state, federal and county agencies, also have been very supportive of the project. Collaboration has and will continue to include: the California Department of Fish and Game, California Department of Boating and Waterways, California State Parks and Recreation, United States Bureau of Reclamation, United States Fish and Wildlife Service, and the United States Department of Agriculture. Additional support has come from: Chapters of the California Native Plant Society, members of the California Invasive Plant Council, many resource conservation districts, Ducks Unlimited, homeowner associations, watershed groups, mosquito abatement districts, public works departments, and private citizens.

The *CDFA Purple Loosestrife Control Project* consists of the following three elements:

- survey and monitoring
- public education
- integrated pest management (control)

The *CDFA Purple Loosestrife Project* surveys waterways and transportation routes adjacent to current infestations to determine the extent of purple loosestrife's spread. Hiking remote waterways, canoeing shallow streams, and the use of airboats in backwater sloughs of the Delta are combined to access remote areas where purple loosestrife might be established. Also, many of the project's collaborators survey waterways in their locales for purple loosestrife and report any finding to the CDFA.

Purple Loosestrife in California



In addition, the *CDFA Purple Loosestrife Control Project* investigates all reported sightings of purple loosestrife from the public. Educational training of other agencies, as well as private citizens, leads to more eyes in the field looking for this harmful invasive weed.

The *CDFA Purple Loosestrife Control Project* implements an integrated pest management program at all infested sites. The primary control method is two applications of glyphosate herbicide a year to prevent seed production and exhaust the seed bank. A single application is used where two applications are not practical. Some of the largest infestations treated are on the San Joaquin/Tuolumne Rivers, Cache Creek, Bear River, and Thermalito Forebay.

Where herbicide applications are not feasible, the *CDFA Purple Loosestrife Control Project* works with local weed control groups to carry out a combination of physical control options including hand removal (digging) and seed head clipping and bagging. Hand removal of purple loosestrife plants can be very effective for small populations. Preventing seed dispersal by seed head clipping and bagging can be very effective in blocking the establishment of new purple loosestrife populations.

The *CDFA Purple Loosestrife Control Project* also cooperates with the CDFA Biological Control Program to release biological control agents targeting purple loosestrife. In 2001, the CDFA Biological Control Program released leaf-eating beetles (*Galerucella* sp.) in both Kern and Shasta counties. Subsequent monitoring has determined that these beetles have become established. In addition, the flower and calyx weevil (*Nanophyes* spp.) is established at

³ The entity that has evolved from the CALFED Bay-Delta Program

A Control Study: Using Goats to Control Perennial Pepperweed in Lassen County

This article contains a condensed version of the research report: Using Goats to Control Perennial Pepperweed, Lepidium latifolium, by Ceci Dale-Cesmat. Contact Ceci at Ceci.dalecesmat@ca.usda.gov if you would like more detail on this study.

Thousands of acres of riparian areas and rangelands of the west have been infested with perennial pepperweed (*Lepidium latifolium*). It is an aggressive perennial that is highly invasive. Over time it will take over a site and become a monoculture. It spreads both vegetatively and by seed dispersal. There are few chemicals that effectively kill it on rangelands and even fewer that can be used in riparian areas. This study was conducted for three years with goats grazing for a 7-month period each year. In this study, several treatments have been used to control the weed. Those treatments include prescribed grazing, grazing followed by chemical treatment and a control. Vegetation responses were measured throughout the growing season using percent composition along belt transects. Nutritional quality of the plant was measured via fecal samples at the Grazing Animal Nutrition Lab at Texas A&M University, using the Near Infrared Reflectance Spectroscopy (NIRS). Animal performance was predicted using the Nutritional Balance Analyzer Program.

The Natural Resources Conservation Service in concert with a goat farmer cooperated to evaluate the effectiveness of using goats to control perennial pepperweed.

Elements of the Study

The Natural Resources Conservation Service in concert with a goat farmer in Lassen County California cooperated to undertake a three-year project to evaluate if goats would be effective in controlling the noxious weed perennial pepperweed. The project is located near Litchfield, California, in the northeastern part of the state within the intermountain sagebrush steppe. The area treated is within the Susan River floodplain and has been cultivated for grass hay and grain crops in the past. At project beginning, the site was fallow with perennial pepperweed occupying most of the acreage. Soils on the property are Humboldt silty clay, poorly drained with some alkalinity and salinity problems. Flooding can be occasional to frequent from February to April.

A 7.5-acre parcel was fenced into four separate paddocks and goats grazed each pasture using a rotational



The Natural Resources Conservation Service in concert with a goat farmer cooperated to evaluate the effectiveness of using goats to control perennial pepperweed.

grazing system. The area is separated into 4 paddocks with coverage of perennial pepperweed ranging from 22%-42%. Forage quality was measured by fecal samples using Near Infrared Reflectance Spectroscopy (NIRS) at the Grazing Animal Nutrition Lab at Texas A&M University. Livestock performance was measured using the Nutritional Balancing Analyzer (NUTBAL) program.

Objectives of this study are to determine:

- (1) If goat grazing alone is a viable method to reduce perennial pepperweed.
- (2) If grazing combined with chemical treatment is a viable option for controlling perennial pepperweed.
- (3) If the botanical composition of the grazing units changes overtime with implementation of the treatments.
- (4) If the forage quality of perennial pepperweed is sufficient to meet the nutritional requirements of the goats.

Chemical Treatments

In mid-July, after the perennial pepperweed had been severely grazed herbicide application treatment was installed on three fenced plots, sizes of 40'x60' each. Separate treatments were applied to each plot. Treatments included: (1) Telar® at 1 oz product per acre, (2) 2-4-D at 32 oz product per acre, (3) A 50/50 mix of Telar® and 2-4-D, at the above rates.

The herbicides were applied with a hand applicator. Results were measured visually at 2 weeks, 4 weeks and 8 weeks post treatment. None of the areas that were treated chemically were grazed.

Poison hemlock (*Conium maculatum*) was sprayed in the Creek Field late August with 2-4-D at 32 oz. per acre. This was done to try to prevent goat poisoning from

this plant.

~~Supplemental feeding~~
Goats that remained on the project had to be supplemented to maintain their body condition. Alfalfa pellets with crude protein (CP) content of 16% was fed free choice. This was about 2.5 pounds per head per day. A fecal sample was taken mid-August, results of this sample were CP 15.81% and dissolved organic matter (DOM) at 56.18%. Goats remained on the site and grazed each pasture in a rotation until mid November each year.



Goats grazing perennial pepperweed near Lithfield, Ca.

FINDINGS

After three years of rotational grazing it was evident that goats will graze perennial pepperweed. If there are enough goats when plants are in the rosette stage they will keep it grazed down to 1"-2" stubble. If the plants are allowed to bolt and get woody, the goats will not graze the stems. They will defoliate the plants, but flowering will still occur. When plants are kept in the rosette phase, they did not flower. Monitoring results showed that perennial pepperweed was reduced in each transect. Greatest changes in species composition occurred in the Creek Field.

In the three chemically treated plots, spraying was done after grazing had reduced the plants to a 1-2" stubble. Plants were then allowed to regrow and bolt. When they were about ready to flower, chemical was applied. In each of the three plots, perennial pepperweed was reduced significantly. All these chemically treated plots were fenced and no grazing occurred after the first application of herbicide.

Chemical application continued for two years during



Goats will graze perennial pepperweed in rosette stage down to 1"-2" stubble.

the project. Perennial pepperweed levels remained very low. The study showed that suppressing the perennial pepperweed with goat grazing increased the efficiency of the chemical. Where chemical application had occurred, annual grasses came in to occupy the site. There was an approximate 48% cover of annual grass and less than 30% bare soil.

It was evident that the goat grazing helped reduce the overall perennial pepperweed

CONCLUSION

in the project area. Grazing could not be used to eliminate the weed, but can be used to help suppress it so that chemical treatment is more effective. In addition, if you have an understory of other vegetation, the grazing will reduce some of the competition of the perennial pepperweed and allow the grasses and other forbs to begin to occupy the site. If the only vegetation in the field is perennial pepperweed, both chemical application and revegetation would be needed to control the weed. Grazing alone would not be effective. The roots of the perennial pepperweed are so large and contain so much stored carbohydrates that it continues to send up new growth.

If dairy goats are used to graze perennial pepperweed, they will need supplemental feed throughout the grazing project. There are not sufficient nutrients in perennial pepperweed to maintain body condition in dairy goats. If meat goats are used, little if any supplementation was needed, if the animals are able to keep plants in the rosette stage. If the plants are allowed to bolt, then there were not sufficient nutrients in the plant for meat goats and they would also need supplementation.

Grazing management is critical in a noxious weed control program. Intensive management to keep the plants in the actively growing rosette stage is critical for successful control. If plants are allowed to bolt, control during that grazing season is lost. Plants will flower and produce seed, which will then germinate the following growing season. In our project grazing management was not adequate. A larger number of goats and better control were required to keep the plants in rosette stage in every field throughout the growing season.

Recommendations for Goats Grazing Perennial Pepperweed:

- Use goats to suppress plants so chemical application will be more effective than if no grazing occurred.

Goats, Page 14...

Noxious Weed Programs Unaffected by ESA Court Order

Noxious weed programs will not be affected by a controversial order issued by the United States District Court for the Western District of Washington to restrict the use of 38 different pesticides. On January 22, 2004, Judge John Coughernour issued an interim injunctive relief order requiring that protective buffer zones be established when using any of the 38 pesticides listed in the court order.

Coughernour determined that the Environmental Protection Agency (EPA) was violating the Endangered Species Act (ESA) by allowing use of certain pesticides known to be toxic to threatened and endangered salmon species. The order essentially suspends the EPA's authority on these chemicals until termination of the order. The court imposed a schedule upon the EPA to determine the effects of the active ingredients and to consult with the National Marine Fisheries Service (NMFS)—the federal agency responsible for implementing the ESA.

Protective buffer zones are now required along "Salmon Supporting Waters" in Washington, Oregon, and California. For purposes of this order, "Salmon Supporting Waters" is defined by the court as "the area below the ordinary high water mark of all streams, lakes, estuaries, and other water bodies where salmon are ordinarily found at some time of the year." Depending on the pesticide a 15 to 50-yard buffer zone must be used for ground-based application and a 75 to 100-yard buffer zone must be used for aerial applications. The court finds that buffer zones effectively avoid putting threatened and endangered salmonids in jeopardy.

The EPA found that many pesticides pose a serious threat to fish and their habitat. This injunction applies to the 38 pesticides listed here. Additionally the court requires that seven of these pesticides must con-

Pesticide warnings

A federal judge ordered that in West Coast cities of 50,000 or more, retailers who sell seven particular pesticides must post a sign — "**Salmon Hazard**" in large letters — along with a warning about hazards to salmon streams. The pesticides are:

- 2,4-D
- carbaryl
- diazinon
- diuron
- malathion
- triclopyr BEE
- trifluralin

Pesticides requiring protective buffers

- acephate
- azinphos-methyl
- bensulide
- bromoxynil
- captan
- carbaryl
- carbofuran
- chlorothalonil
- chlorpyrifos
- coumaphos
- 2,4-D
- diazinon
- 1,3-dichloropropene
- diflubenuron
- dimethoate
- disulfoton
- diuron
- ethoprop
- fenamiphos
- fenbutatin-oxide
- lindane
- linuron
- malathion
- methamidophos
- methidathion
- methomyl
- methyl parathion
- metolachlor
- metribuzin
- naled
- oxyflourfen
- pendimethalin
- phorate
- prometryn
- propargite
- tebuthiuron
- triclopyr BEE
- trifluralin

tain a warning label stating "Salmon Hazard" in large letters when sold in cities with human populations of 50,000 or more.

Noxious weed programs are excluded from this order when administered by public entities and when implementing the safeguards routinely required by NMFS under the ESA. These safeguards include a determination by NMFS that program activities are unlikely to put salmon or steelhead populations in jeopardy.

You can find a copy of the court's order at the Earth Justice website www.earthjustice.org.

.....EDRR System, continued from page 5.

Testing plan for the National EDRR System will be implemented by FICMNEW agencies in fiscal year 2004. Once these tests have been completed a guide for planning nationwide implementation will be developed. The second phase will also address the following questions: (1) which agency will house the permanent position of the National EDRR Coordinator? (2) Which agency should have the primary leadership role? (3) Should the regional coordinators be federal positions or supported by the states within that region?

With an EDRR system in place, the nation will be better able to defend against future economic and environmental losses resulting from invasive plant species. For more information visit the FICMNEW website at <http://fcmnew.fws.gov/index.html> or contact Mike Ielmini, with the USDA Forest Service at mielmini@fs.fed.us.

Dogs Might Someday Aid in Early Detection

Researcher Kim Goodwin, a weed prevention coordinator at Montana State University at Bozeman, is conducting a study to determine whether or not dogs could help humans detect noxious weeds. Goodwin is working with dog trainer Hal Steiner in a preliminary study to train a Rocky Mountain Shepard named "Knapweed Nightmare" in detecting spotted knapweed. Spotted knapweed infests 5 million acres in Montana, costing the state's economy \$42 million a year. Right now land managers and ranchers survey important areas looking for spotted knapweed. Many plants are found, but many more, particularly smaller seedlings, are overlooked and left to mature. They believe a dog properly trained in detecting the scent of spotted knapweed could be successful in locating young plants and alerting land managers to its exact location.

Knapweed Nightmare was previously being trained in drug detection for law enforcement but is now slowly being introduced to the scent of spotted knapweed. Trials are scheduled to begin this spring. The dog will be equipped with a GPS unit, for tracking, and will be unleashed on 10-acre rangeland parcels with known areas of spotted knapweed. The researchers suspect that the most challenging part will be keeping the dog focused on the job. If the study proves to be successful, dogs may one day join land managers in early-detection efforts.

For more information on this study contact:
Kim Goodwin
(406) 994-6749
Hal Stiner: (406) 388-1197



Dog trainer Hal Steiner works on introducing "Knapweed Nightmare" to the scent of spotted knapweed.

...Herbicide, continued from page 7.
resistant before seeds are produced. Such prevention and integrated programs are widely used in Australia, where the widespread occurrence of multiple-herbicide resistant weeds has forced growers and land managers to change their approach to weed management. **For more information on herbicide resistant weeds, including lists and distribution maps, visit the Weed Science.org website at <http://www.weedscience.org/in.asp>.**

...Loosestrife, continued from page 9.
three sites in Shasta County. The root-boring weevil (*Hylobius* sp.) is believed to be established in Shasta County from previous introductions followed by additional releases in both Shasta and Kern counties in 2003.

To date, the *CDFA Purple Loosestrife Control Project*, with the help of the public, has determined the major populations of purple loosestrife in the state. At all sites, an integrated pest management (control) program has been implemented to prevent spread and to control the population. With further funding and time, the *CDFA Purple Loosestrife Control Project* can continue to combat this noxious weed and protect the wetlands of the State of California.

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EPA Approves Habitat® Herbicide

BASF Corporation announced on January 6, 2004 that Habitat® herbicide has received full label approval from the U.S. EPA. This herbicide is labeled for controlling undesirable emergent, shoreline, and woody wetland-aquatic vegetation, in and around water sources. Habitat is absorbed through leaves, stems, and roots and becomes translocated rapidly throughout the plant. Treated plants die within two weeks of treatment.

Habitat® herbicide is applied using low volume spray techniques, which results in more effective control, often reducing the need for multiple applications. BASF claims that this herbicide effectively controls many invasive weeds including: water hyacinth, water lettuce, duckweed, alligatorweed, American lotus, cattail, water lily, phragmites, torpedo grass, purple loosestrife, giant reed, willow, melaleuca, salt cedar, and others. First time users of Habitat herbicide should contact a BASF technical representative for assistance prior to application. This herbicide is not registered yet for use in California. BASF will submit an application to the California Department of Pesticide Regulation this fall and, if approved, it should be available sometime next year. Contact BASF representative John Smith at 503-510-1123 or smithjh@basf.com.



...Goats, continued from page 11.

- Use a high stocking rate with an intensive rotational grazing system, to keep plants in the rosette stage throughout the growing season.
- If understory grasses, forbs, sedges or rushes exist in the field goats can be used to effectively suppress perennial pepperweed so that the other species can re-occupy the site. This will only occur if irrigation can be applied during the growing season to keep the other species actively growing.
- If there is no or little understory vegetation, grazing alone will not eliminate perennial pepperweed.
- Re-vegetation and chemical application will be needed to restore the site to its original condition, but goats can be used to control the biomass so that chemical application is more effective. Re-seed with a small grain or other annual grass crop so follow-up chemical treatments can be applied that will not affect the grass.
- Always keep in mind the large carbohydrate reserves in the roots and know that control of this plant is a long-term

New Field Guide for the Bay Area's Backyard

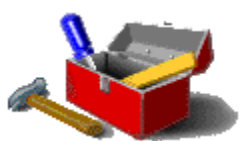
Summarized by Marisa Flores, CDFA-IPC

Plants of the San Francisco Bay Region: Mendocino to Monterey, Revised Edition, 2003 by Linda H. Beidleman and Eugene N. Kozloff, provides an introduction to the vascular native and non-native plants found in Marin, Sonoma, Napa, Solano, Contra Costa, Alameda, San Mateo, Santa Clara, and San Francisco counties. The San Francisco Bay area is highly populated and a large industrialized center but this region is still home to over 2,000 species, subspecies and varieties of plants. The second edition is the most recent and up-to-date version of the field guide.

The introduction of *Plants of the San Francisco Bay Region* gives a general background on how to use an identification key, the measurements you should take in the field, and how to understand the information the field guide provides. This "easy-to-use guide" identifies plants by both scientific name and common name, and also contains identification keys and photographs of plant specimens.

Both amateur and professional naturalists can easily identify plants using this field guide. Along with its use as a field guide, *Plants of the San Francisco Bay Region* provides the reader with advice on conservation of the native plant species in the Bay Area. It also gives a history of the region's attempts at sustaining the diversity of flora and providing habitats for the growth of native species. Geographic ranges and habitat types, along with topography and soil types are covered in detail as well, to provide a complete guide to the structure of plant communities and species.





Toolbox: An Alternative to Conventional Herbicides

TOOLBOX highlights new tools that might integrate well into local weed management tool boxes. Noxious Times does not specifically endorse tools featured, but rather strives to provide baseline data that will lend towards further examination and research on the part of the user.

Blackberry & Brush Block® is a highly concentrated wine vinegar byproduct of the wine industry. The mixture is of citric acid, acetic acid, and water.

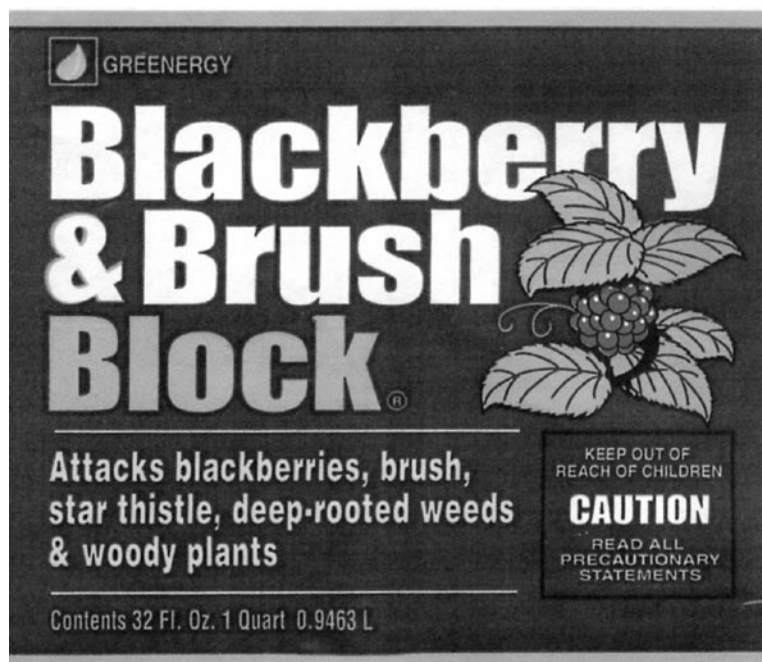
The mixture is effective in controlling unwanted plants because it reduces the soil pH to 3, a level unsuitable for plants, for 60 to 90 days. Because it causes the soil to become inhospitable to plants, the producers of the product, Greenergy, Inc., recommend treating the soil with lime before replanting. The kill is not species-specific so it is important that the product not make contact with desirable or beneficial plants, including through a drip line or near the root zone. However, the mixture only spreads about four inches from the spray area in the soil.

UC Davis researchers Joe DiTomaso, an extension weed specialist, and Guy Kyser, a staff research associate, conducted a trial and found that this product could effectively control many annual weeds, including yellow starthistle, California's most troublesome noxious weed. The researchers stated that even though yellow starthistle is remarkably resilient "...it is possible to get complete kill of yellow starthistle with a late season application of acetic/citric acid at high volume treatments." In the trial, the mixture was applied directly to the plant, which resulted in a quick burn-down of yellow starthistle foliage. The mixture also gave control of annual weeds such as redmaids, shepherdspurse, chickweed, annual bluegrass and fiddleneck. Later treatments controlled prostrate pigweed, knotweed, and witchgrass, and gave partial control of lambsquarters and little mallow. It is also possible that even lower rates of acetic/citric acid could be effective.

According to Greenergy Inc., Blackberry & Brush Block® is a new minimum risk product that is an effective alternative to conventional herbicides, like Crossbow® and Roundup®. This product has been on the market for the last three years in Oregon, Washington, and in Northern California; currently there aren't any similar products as powerful on the market. When purchased in smaller quantities, Blackberry & Brush Block® is about the same price as synthetic herbicides. To save money one would need to purchase Blackberry & Brush Block® by the drum or even the truck load.

Using the Product

Greenergy, Inc. recommends mixing the product 1 quart (32 fl. Oz) of Blackberry & Brush Block® with 3 quarts of water to cover 250 square-feet. For heavier infestations, the company recommends to use 1 quart of the product with 1 quart of water to cover 100 square-feet. This product can be applied to either the soil near the plant's roots, or to the foliage, depending on the root system. Blackberry & Brush Block® should be applied to the soil to control plants that root out along the subsurface of the soil, and are within approximately 8 inches deep, like horsetail, dandelion, and morning glory. If the plant has deeper root system, like yellow starthistle, then the product should be applied directly to the foliage.



Contact Greenergy, Inc.:
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www.greenergyinc.com
greenergy@earthlink.net
P.O. Box 6669
Brookings, OR 97415

Upcoming Events:

Upcoming Event with The California Native Grass Association:

May 25 & 26, Grass Identification and Appreciation Workshop will be taught in **Northern California**. The first day will be in Davis; the second day will be throughout Yolo County. The cost is \$175 per member and \$210 for non-members.

If you would like information on this event contact the administrative director by email at admin@cnga.org

4th International Weed Science Congress, "Weed Science Serving Humanity" June 20-24 2004

will be held at the International Conference Center, Durban, **South Africa**. The conference will be bringing together scientists and weed managers from all parts of the world. Information can be obtained from the conference website: <http://www.olemiss.edu/orgs/iws/4intlweedcong.htm>

44th Annual Meeting of the Aquatic Plant Management Society, July 11-14, 2004

will be held at the Hyatt Regency Tampa, in **Tampa, Florida**.

Diverse oral and poster presentations on the latest research and management activities will be presented. Information can be obtained from the conference website: www.apms.org/2004/2004.htm

Save the Date...

3rd International Conference on Invasive Spartina, November 8-10

at the U.S. EPA Region 9 Headquarters, 75 Hawthorne Street, **San Francisco California**.

Will provide a forum for the best and latest Spartina research from around the world, including experiences from marsh managers and technical experts. To receive a call for papers, an invitation, and registration materials email contact information to: conference@spartina.org

13th International Conference on Aquatic Invasive species, November 19-23, 2004

will be held at the Lynch West County Hotel and Conference Centre, Ennis, County Clare, **Ireland**. This conference will address issues associated with invasive inver-

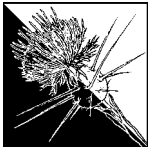
tebrates, fish, and plants. Contact Elizabeth Muckle-Jeffs 1-800-868-8776. Information can be obtained from the conference website: www.aquatic-invasive-species-conference.org

3rd Biennial California Bay-Delta Authority Program (CALFED) Science Conference, October 4-6 2004

will be held at the Sacramento Convention Center, **Sacramento, California**. This conference is a forum for presenting scientific information and ideas relevant to the Program's goals in the watershed. Information can be obtained from the conference website: iep.water.ca.gov/calfed/sciconf/2004/

57th Annual Meeting of the California Weed Science Society, January 10-12, 2005

will be held at the Double Tree hotel, Monterey, California. Information can be obtained from the conference website: www.cwss.org



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NOXIOUS TIMES

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